Project Title:
Energy Scaling of Flare Phenomena During the Solar Cycle

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Project Information:
Quantifying and physical modeling of the energy scaling of flare-related phenomena on all scales is important to arrive at a better understanding of the solar variability and solar-terrestrial interactions. We propose to investigate the statistics of geometric and physical parameters that control the energy scaling of solar flare phenomena during the solar cycle (from nanoflares to CMEs). Since the volume represents the most decisive parameter for the energy estimate of a flare process, we pursue a new and more sensible approach to measure first the fractal geometry (using Yohkoh, TRACE, SoHO/MDI, and EIT images), to quantify the accurate scaling laws between observed length scales, projected areas, and volumes. Combined with the measurements of other physical parameters, such as time scales, densities, temperatures, and magnetic field strengths, we develop then physical models of the scaling laws between observed parameters. The frequency distributions and correlations between different solar activity indicators in different wavelengths can den be quantified from first principles, permitting us to use one solar activity indicator as a proxy for another and to predict the energy content of various solar flare-associated phenomena in an early-warning phase.

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